

This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found [here](#).

If you have a suggestion to make the keys better, please fill out the short survey [here](#).

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

- Find the inverse of the function below. Then, evaluate the inverse at $x = 8$ and choose the interval that $f^{-1}(8)$ belongs to.

$$f(x) = \ln(x - 4) + 2$$

The solution is $f^{-1}(8) = 407.429$, which is option C.

A. $f^{-1}(8) \in [50.6, 61.6]$

This solution corresponds to distractor 4.

B. $f^{-1}(8) \in [162749.79, 162758.79]$

This solution corresponds to distractor 2.

C. $f^{-1}(8) \in [406.43, 412.43]$

This is the solution.

D. $f^{-1}(8) \in [22026.47, 22035.47]$

This solution corresponds to distractor 1.

E. $f^{-1}(8) \in [398.43, 402.43]$

This solution corresponds to distractor 3.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y , use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

- Multiply the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = 9x^3 + 7x^2 + 8x + 4 \text{ and } g(x) = 7x^3 + 4x^2 + 9x + 7$$

The solution is $(-\infty, \infty)$, which is option E.

A. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-7.5, -5.5]$

B. The domain is all Real numbers less than or equal to $x = a$, where $a \in [3.4, 6.4]$

C. The domain is all Real numbers except $x = a$, where $a \in [2.8, 9.8]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [6.25, 10.25]$ and $b \in [5.8, 8.8]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

- Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = 11$ and choose the interval that $f^{-1}(11)$ belongs to.

$$f(x) = 5x^2 + 3$$

The solution is The function is not invertible for all Real numbers. , which is option E.

A. $f^{-1}(11) \in [1.47, 1.75]$

Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift.

B. $f^{-1}(11) \in [5.09, 5.31]$

Distractor 4: This corresponds to both distractors 2 and 3.

C. $f^{-1}(11) \in [2.19, 2.55]$

Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative.

D. $f^{-1}(11) \in [1.13, 1.27]$

Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1.

E. The function is not invertible for all Real numbers.

* This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

4. Multiply the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = \sqrt{-4x + 14} \text{ and } g(x) = 8x^2 + 8x + 5$$

The solution is The domain is all Real numbers less than or equal to $x = 3.5$, which is option C.

A. The domain is all Real numbers except $x = a$, where $a \in [4.33, 13.33]$

B. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-7.25, 1.75]$

C. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-2.5, 8.5]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-0.67, 5.33]$ and $b \in [5.4, 10.4]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

5. Choose the interval below that f composed with g at $x = 1$ is in.

$$f(x) = -4x^3 + 3x^2 + x - 2 \text{ and } g(x) = -x^3 - 2x^2 + 3x$$

The solution is -2.0 , which is option C.

A. $(f \circ g)(1) \in [-7.5, -5.4]$

Distractor 1: Corresponds to reversing the composition.

B. $(f \circ g)(1) \in [-1.8, -0.2]$

Distractor 3: Corresponds to being slightly off from the solution.

C. $(f \circ g)(1) \in [-3.8, -1.6]$

* This is the correct solution

D. $(f \circ g)(1) \in [-10, -7.5]$

Distractor 2: Corresponds to being slightly off from the solution.

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

6. Choose the interval below that f composed with g at $x = 1$ is in.

$$f(x) = -2x^3 + 4x^2 - 4x \text{ and } g(x) = -x^3 + 2x^2 - x + 3$$

The solution is -30.0 , which is option B.

A. $(f \circ g)(1) \in [27, 35]$

Distractor 3: Corresponds to being slightly off from the solution.

B. $(f \circ g)(1) \in [-35, -28]$

* This is the correct solution

C. $(f \circ g)(1) \in [20, 23]$

Distractor 1: Corresponds to reversing the composition.

D. $(f \circ g)(1) \in [-23, -22]$

Distractor 2: Corresponds to being slightly off from the solution.

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

7. Determine whether the function below is 1-1.

$$f(x) = -12x^2 - 99x - 195$$

The solution is no, which is option D.

A. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

B. No, because there is an x -value that goes to 2 different y -values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

C. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

D. No, because there is a y -value that goes to 2 different x -values.

* This is the solution.

E. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y -value that goes to 2 different x -values.

8. Determine whether the function below is 1-1.

$$f(x) = (5x - 36)^3$$

The solution is yes, which is option C.

A. No, because there is an x -value that goes to 2 different y -values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

B. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

C. Yes, the function is 1-1.

* This is the solution.

D. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

E. No, because there is a y -value that goes to 2 different x -values.

Corresponds to the Horizontal Line test, which this function passes.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y -value that goes to 2 different x -values.

9. Find the inverse of the function below. Then, evaluate the inverse at $x = 7$ and choose the interval that $f^{-1}(7)$ belongs to.

$$f(x) = \ln(x - 5) - 4$$

The solution is $f^{-1}(7) = 59879.142$, which is option E.

A. $f^{-1}(7) \in [59862.14, 59872.14]$

This solution corresponds to distractor 3.

B. $f^{-1}(7) \in [24.09, 28.09]$

This solution corresponds to distractor 1.

C. $f^{-1}(7) \in [162746.79, 162754.79]$

This solution corresponds to distractor 2.

D. $f^{-1}(7) \in [0.39, 10.39]$

This solution corresponds to distractor 4.

E. $f^{-1}(7) \in [59879.14, 59883.14]$

This is the solution.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y , use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

10. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -14$ and choose the interval that $f^{-1}(-14)$ belongs to.

$$f(x) = 4x^2 + 3$$

The solution is The function is not invertible for all Real numbers. , which is option E.

A. $f^{-1}(-14) \in [1.53, 1.84]$

Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift.

B. $f^{-1}(-14) \in [2.88, 3.62]$

Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative.

C. $f^{-1}(-14) \in [1.89, 2.14]$

Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1.

D. $f^{-1}(-14) \in [3.81, 4.19]$

Distractor 4: This corresponds to both distractors 2 and 3.

E. The function is not invertible for all Real numbers.

* This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!
